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ABSTRACT

To discover if narrative analogies of scientific mechanisms would help readers to comprehend passages describing those mechanisms, four such passages were extracted from an encyclopedia. These original passages were written in expository style and constituted the expository condition. For the narrative condition, simple narrative analogies of these passages were written that incorporated most of the components, attributes, relationships, and processes of the scientific mechanisms. Each subject read passages in four different conditions: (1) the narrative-expository condition, in which the narrative analogy was presented first followed by the corresponding expository passage: (2) the expository-narrative condition, in which the order of presentation was reversed: (3) the narrative analogy presented alone: and (4) the expository passage presented alone. After reading the passages on a particular scientific mechanism, the subjects each took a comprehension test containing 15 forced-choice questions divided into wording, statement, and inference test item categories. The results showed that the presentation of narrative analogies did facilitate the acquisition of the scientific mechanism passages, although the facilitation was modest. An unexpected finding was that, regardless of the condition, subjects were unable to make inferences about the information they read. (FL)

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THE EFFECT OF NARRATIVE ANALOGIES ON THE ACQUISTION OF PASSAGES DESCRIBING SCIENTIFIC MECHANISMS

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Stars are presumably formed from the grains and gas in the interstellar medium. The material between the stars is not uniformly distributed in space but spread in a patchy fashion. Occasionally a cloud will form sufficiently large for gravitational attractions to draw it together....

This is an excerpt from an expository passage which describes a scientific mechanism. Prior research has shown that this type of passage is very difficult to understand. Various reasons for this difficulty have been suggested. For example, there are difficult logical and causal relationships between the components. Other studies have demonstrated that passages written in the simpler narrative form are much easier for people to understand. Stories are very easy to understand.

A different line of research has investigated the effects of advanced organizers on the acquisition of new material. For the most part, these studies have shown that advanced organizers such as outlines, show little or no facilitation. After reviewing these results, Royer and Cable proposed two conditions they feel are necessary before organizing devices will facilitate acquisiton. First, the passages to be learned must be sufficiently difficult and secondly the organizing device must provide a "knowledge bridge" between information the subject already has and the material to be learned.

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Our study tested the hypothesis that narrative analogies of scientific mechanisms will facilitate the comprehension of passages describing scientific mechanisms. To test this hypothesis we extracted four passages describing scientific mechanisms from an encyclopedia. The scientific mechanisms were: Photosynthesis, the Galvanometer, the Birth of a Star, and a Nuclear Reactor. These passages were written in expository style and constituted the expository condition. Simple narrative analogies of these passages were written which attempted to incorporate most of the components, attributes, relationships, and processes of the scientific mechanisms. These passages made up the narrative condition.

Altogether, each subject read passages in four different conditions. In one condition the narative analogy was presented first followed by the corresponding expository passage, this was the Narrative-Expository condition. In the second condition the expository passage came first, followed by the narrative analogy. This was the Expository-Narrative condition. In the instructions the subjects were told that the narrative passages were simple analogies of the more complex expository passages, and the subjects were explicitly told to relate the two passages. Thus, we emphatically pointed out the relationship between the expository passage and its narrative analogy. In the third condition the narrative analogy was presented alone. The fourth condition was presentation of the expository passage alone. The assignment of the four conditions to the four scientific mechanisms was counterbalanced across subjects.

After reading the passages on a particular scientific mechanism, the subject took a comprehension test. Each test included 15 questions presented in a 3 alternative forced-choice format. These 15 questions were equally divided into wording, statement, and inference test item categories. These categories were designed to tap successively deeper levels of text comprehension. Inference items call for a deeper understanding than statement items and statement items call for a deeper understanding than wording items. In order to establish a baseline for prior knowledge on the scientific mechanisms, a control group took the 3AFC test without reading any passages.

A within subjects analysis of variance was performed using an acquisition condition x item category factorial design. The dependent variable was the proportion of correct answers on the 3AFC test. Overall means appear on the top of the handout. Since the control group and the Narrative means were nearly identical performance in the Narrative conditon was used as the base rate assessing acquisition in the Expository, Narrative-Expository, and Expository- Narrative conditons. A significant main effect was found for presentation condition. Planned comparisons showed that there were no differences between the Narrative-Expository and Expository-Narrative conditions, but that both these conditions had significantly higher proportions of correct answers than the Expository condition. In addition, the proportions were significantly higher in the Expository than in the Narrative condition. Facilitation scores for the test item categories were computed to contol for the base knowledge

rate and guessing. These scores are also reported on the handout. It is evident that performance on the test decreased as the test items quizzed deeper levels of conceptual analysis. In fact, the subjects were entirely unable to answer inference items correctly.

Overall, the results of this study revealed that the presentation of narrative analogies did facilitate the acquistion of the scientific mechanism passages, but the facilitation was modest. A more interesting finding is that regardless of the condition, subjects were unable to make inferences about the information they read.

A follow-up study was conducted to assess whether the differences in reading time was responsible for the modest facilitation of narrative analogies. In the first study, the subjects were allowed 5 minutes reading time per scientific mechanism. This resulted in 10 minutes reading time in the two passage conditions and only 5 minutes reading time in the one passage conditions. Study 2 corrected for the reading time artifact in Study 1. When the subjects were allowed 10 minutes reading time in all conditions the significant differences in the first study were not replicated. However, the finding that was replicated was the subjects inability to answer the inference test items. The results from this study are listed on the handout under Study 2.

At this point we questioned whether or not the test items we were using could be inferred from the passages at all. To answer

this question we had another group of subjects read only the expository passages and then answer the questions. In this study the subjects were allowed to refer back to the passages in order to answer the questions. Given the chance to refer to the text subjects correctly identified a much greater proportion of the correct answers. Mean proportion of correct answers were .83, .69, and .58 for wording, statement, and inference items, respectively. Eventhough the subjects were able to refer back to the passages, there was still a significant main effect of item category. It is clear that the subjects were able to identify some inference items but for the most part their performance was very poor.

At present it appears that this study is another example of the ineffectiveness of advanced organizing devices in facilitating acquisition. This study also failed to find facilitative effects from organizing devices presented after the material to be learned.

Is it possible that people are simply unable to make inferences? It may be too early to tell but the results of this research indicate that we should not be too hopeful about peoples ability to make inferences.

Thank You

Overall Proportion of Correct Answers as a Function of Acquisition Condition

Study 1

Acquistion Condition	Means
Narrative-Expository	.52
Expository-Narrative	.54
Expository	.46
Narrative	.39
Control	.41

Study 2

Narrative-Expository	.53
Expository-Narrative	.49
Expository-Expository	.56
Narrative-Narrative	.41
Control	.40

Facilitation Scores

Study 1

Item Category	Score
Wording	.19
Statement	.11
Inference	.06

Study 2

Wording	.26
Statement	.08
Inference	-.05